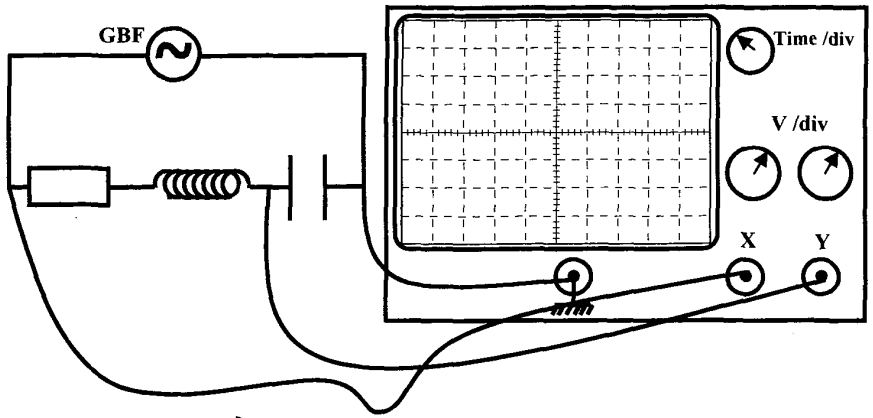
e-



$$\left.\begin{array}{l}\Delta t < \dfrac{T_2}{4} \\ \Delta\varphi = \omega.\Delta t\end{array}\right\} \Rightarrow \Delta\varphi < \omega_2.\frac{T_2}{4} \Rightarrow \Delta\varphi < \frac{2\pi}{T_2}.\frac{T_2}{4} \Rightarrow \Delta\varphi < \frac{\pi}{2}$$

u est toujours en avance de phase par rapport à u_c

$$0 < \varphi_u - \varphi_{u_C} < \frac{\pi}{2}$$

$$\text{or } \varphi_{u_C} = \varphi_i - \frac{\pi}{2} \text{ donc } \varphi_u - \left(\varphi_i - \frac{\pi}{2}\right) < \frac{\pi}{2} \Rightarrow \varphi_u - \varphi_i < 0$$

u en retard % a i ↦ circuit capacitif

b- $u = Z_2 I_2 \rightarrow Z_2 = \dfrac{U}{I_2} = \dfrac{12}{0,32} = 37,5A$

$$Z_2 = \sqrt{(R+r)^2 + \left(L\omega - \frac{1}{C\omega}\right)^2} \Rightarrow Z_2^2 = (R+r)^2 + \left(L\omega - \frac{1}{C\omega}\right)^2$$

$$\Rightarrow \left(L\omega - \frac{1}{C\omega}\right)^2 = Z_2^2 - (R+r)^2 \Rightarrow L\omega - \frac{1}{C\omega} = \pm\sqrt{Z_2^2 - (R+r)^2}$$

$$\Rightarrow L\omega_2 - \frac{1}{C\omega} = \pm\sqrt{Z_2^2 - (R_0+r)^2} \Rightarrow L\omega_2^2 - \frac{1}{C} = \pm\omega_2\sqrt{Z_2^2 - (R_0+r)^2}$$

$$\Rightarrow \underset{\downarrow a}{0,04}\omega_2^2 + \omega_2\sqrt{\underset{\downarrow b}{(37,5)^2} - (30)^2} - \underset{\downarrow c}{\frac{1}{16.10^{-6}}} = 0$$

$$\omega_2 = 1000 rad.s^{-1}$$

c- Facteur de puissance:

$$\cos(\varphi_u - \varphi_i) = \frac{R_0 + r}{Z} = \frac{30}{37,5} = 0,8$$

- $u_{R_0}(t) = U_{R_0 m}\sin\left(\omega_2 t + \varphi_{u_{R_0}}\right)$

$U_{R0m} = R_0.I_m = 20.0,32.\sqrt{2} = 9$ V

- $\varphi_u - \varphi_i = \cos^{-1}(0,8)$

  $\varphi_u - \varphi_i = \pm 0,64$ rad or circuit capacitif $\Rightarrow$ **<0**

  $\Rightarrow \varphi_u - \varphi_i = -0,64$ rad $\Rightarrow \varphi_i = 0,64$ rad $= \varphi_{u_{R_0}}$

  $u_{R_0}(t) = 9\sin(10^3 t + 0,64)$ en V.

d-

$$\mathcal{P} = \frac{U_m.I_m}{2}\cos(\varphi_u - \varphi_i) = U.I\cos(\varphi_u - \varphi_i)$$

$\mathcal{P} = 12.0,32.0,8 = 3,07$W

Ou bien :